

Application No. 10/686,951  
Attorney Docket No. 2003B043/2  
Reply to Office Action dated January 3, 2007  
Response dated April 3, 2007

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**LISTING OF THE CLAIMS:**

**CLAIMS**

We Claim:

1. (Currently Amended) An adhesive comprising a polymer comprising at least 50 mol% of one or more C3 to C40 olefins where the polymers has:
  - a) a Dot T-Peel of 1 Newton or more on Kraft paper;
  - b) an Mw of 10,000 to 100,000; and
  - c) a branching index (g') of 0.98 or less measured at the Mz of the polymer when the polymer has an Mw of 10,000 to 60,000, or  
a branching index (g') of 0.95 or less measured at the Mz of the polymer when the polymer has an Mw of 10,000 to 100,000;
  - d) an amorphous content of at least 50%; and
  - e) a crystallinity of at least 5%.
2. (Original) The adhesive of claim 1 wherein the polymer has:
  - a) a Dot T-Peel of 1 Newton or more on Kraft paper;
  - b) a branching index (g') of 0.98 or less measured at the Mz of the polymer;
  - c) a Mw of 10,000 to 60,000; and
  - d) a heat of fusion of 1 to 50 J/g.
3. (Previously Presented) The adhesive of claim 1 where the polymer is a homopolypropylene or a copolymer of propylene and up to 5 mole% ethylene having:
  - a) an isotactic run length of 1 to 30,
  - b) a percent of r dyad of greater than 20%,
  - c) a heat of fusion of between 1 and 70 J/g; and
  - d) a g' measured at the Mz of 0.95 or less.
4. (Original) The adhesive of claim 1 wherein the polymer comprises propylene and less than 15 mole % of ethylene.

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5. (Original) The adhesive of claim 1 wherein the polymer has a melt viscosity of 7000 mPa•sec or less at 190°C.
6. (Original) The adhesive of claim 1 wherein the polymer has a melt viscosity of 5000 mPa•sec or less at 190°C.
7. (Original) The adhesive of claim 1 wherein the polymer has a melt viscosity of between 250 and 6000 mPa•sec at 190°C.
8. (Original) The adhesive of claim 1 wherein the polymer has a melt viscosity of between 500 and 3000 mPa•sec at 190°C.
9. (Original) The adhesive of claim 4 wherein the polymer has a Tg of 0°C or less.
10. (Original) The adhesive of claim 4 wherein the polymer has a Tg of -10°C or less.
11. (Original) The adhesive of claim 1 wherein the polymer has an Mw of 10,000 to 75,000 and a branching index of 0.6 or less.
12. (Original) The adhesive of claim 1 wherein the polymer has an Mw of 10,000 to 50,000 and a branching index of 0.7 or less.
13. (Original) The adhesive of claim 1 wherein the polymer has an Mw of 10,000 to 30,000 and a branching index of 0.98 or less.
14. (Original) The adhesive of claim 1 wherein the polymer has a branching index (g') of 0.90 or less measured at the Mz of the polymer.

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15. (Original) The adhesive of claim 1 wherein the SEC graph of the polymer is bi- or multi-modal.
16. (Cancelled)
17. (Original) The adhesive of claim 1 wherein the polymer has
  - a) a peak melting point between 60 and 190°C;
  - b) a heat of fusion of 0 to 70 J/g; and
  - c) a melt viscosity of 8000 mPa•sec or less at 190°C.
18. (Original) The adhesive of claim 1 wherein the polymer has:
  - a) a Tg of -10°C or less;
  - b) a melt viscosity between 2000 and 6000 mPa•sec;
  - c) a molecular weight distribution (Mw/Mn) of at least 5; and
  - d) a bi- or multi-modal SEC graph of the polymer.
19. (Cancelled)
20. (Original) The adhesive of claim 1 wherein the polymer has 20 wt.% or more of hexane room temperature soluble fraction and 50 wt % or less of Soxhlet heptane insolubles.
21. (Original) The adhesive of claim 1 wherein the polymer comprises less than 3.0 mole % ethylene.
22. (Original) The adhesive of claim 1 wherein the polymer comprises less than 1.0 mole % ethylene.
23. (Original) A composition comprising the polymer of claim 1 and a functionalized wax.
24. (Original) A composition comprising the polymer of claim 1 and a wax.

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25. (Original) A composition comprising the polymer of claim 1 and a hydrocarbon resin.
26. (Original) The adhesive of claim 1 wherein the polymer further comprises diolefin.
27. (Original) The adhesive of claim 26 wherein the diolefin comprises one or more C4 to C40 diolefins.
28. (Original) The adhesive of claim 26 wherein the diolefin is selected from the group consisting of 1,6-heptadiene, 1,7-octadiene, 1,8-nonadiene, 1,9-decadiene, 1,10-undecadiene, 1,11-dodecadiene, 1,12-tridecadiene, 1,13-tetradecadiene, cyclopentadiene, vinylnorbornene, norbornadiene, ethylidene norbornene, divinylbenzene, dicyclopentadiene, polybutadienes having an Mw less than 1000 g/mol, or combinations thereof.
29. (Original) The adhesive of claim 1 wherein the polymer has an Mz/Mn of 2 to 200.
30. (Original) The adhesive of claim 1 wherein the polymer has an Mz of 15,000 to 500,000.
31. (Original) The adhesive of claim 1 wherein the polymer has a SAFT of 50 to 150°C.
32. (Original) The adhesive of claim 1 wherein the polymer has a Shore A hardness of 90 or less.
33. (Original) The adhesive of claim 1 wherein the polymer has a set time of 5 seconds or less.
34. (Original) The adhesive of claim 1 wherein the polymer has an Mw/Mn of 2 to 75.
35. (Original) The adhesive of claim 1 wherein the polymer has a percent crystallinity of between 5 and 40 %.

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36. (Original) The adhesive of claim 1 wherein the  $g'$  is 0.90 or less.
37. (Original) The adhesive of claim 1 wherein the  $g'$  is 0.80 or less.
38. (Original) The adhesive of claim 1 wherein the polymer has a viscosity at 190 °C of 20,000 mPa•s or less.
39. (Original) The adhesive of claim 1 wherein the polymer has a viscosity at 160 °C of 8,000 mPa•s or less.
40. (Original) The adhesive of claim 1 wherein the polymer has a heat of fusion greater than 10 J/g.
41. (Original) The adhesive of claim 1 wherein the polymer has heat of fusion of from 20 to 70 J/g.
42. (Original) The adhesive of claim 1 wherein the polymer has heat of fusion of from 30 to 60 J/g.
43. (Original) The adhesive of claim 1 wherein the polymer has a percent crystallinity of 10-30 %.
44. (Original) The adhesive of claim 1 wherein the polymer has tensile strength at break of 0.75 MPa or more.
45. (Original) The adhesive of claim 1 wherein the polymer has a SAFT of 100-130°C.
46. (Original) The adhesive of claim 1 wherein the polymer has an  $M_z/M_n$  of 2 to 200.
47. (Original) The adhesive of claim 1 wherein the polymer has a Shore A hardness of 20-90.

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48. (Original) The adhesive of claim 1 wherein the polymer has a Dot T-Peel of between 3 and 10,000 N.

49. (Original) The adhesive of claim 1 wherein the polymer has a Dot T-Peel of between 10 and 2,000 N.

50. (Original) The adhesive of claim 1 wherein the polymer has a tensile strength at break of 0.6 MPa or more.

51. (Original) The adhesive of claim 1 wherein the polymer has a Tg of between 5 and -65°C.

52. (Original) The adhesive of claim 1 wherein the polymer comprises at least 50 weight % propylene.

53. (Original) The adhesive of claim 1 wherein the polymer comprises at least 50 weight % propylene and up to 50 weight % of a comonomer selected from the group consisting of ethylene, butene, hexene, octene, decene, dodecene, pentene, heptene, nonene, 4-methyl-pentene-1, 3-methyl pentene-1, 3,5,5-trimethyl-hexene-1, and 5-ethyl-1-nonene.

54. (Original) The adhesive of claim 1 wherein the polymer comprises at least 50 weight % propylene and 5 weight % or less of ethylene.

55. (Original) The adhesive of claim 1 wherein the polymer comprises up to 10 weight % of a diene selected from the group consisting of: butadiene, pentadiene, hexadiene, heptadiene, octadiene, nonadiene, decadiene, undecadiene, dodecadiene, tridecadiene, tetradecadiene, pentadecadiene, hexadecadiene, heptadecadiene, octadecadiene, nonadecadiene, icosadiene, heneicosadiene, docosadiene, tricosadiene, tetracosadiene, pentacosadiene, hexacosadiene, heptacosadiene, octacosadiene, nonacosadiene, triacontadiene, cyclopentadiene, vinylnorbornene, norbornadiene, ethylidene norbornene, divinylbenzene, and dicyclopentadiene.

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56. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more tackifiers.

57. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more tackifiers selected from the group consisting of aliphatic hydrocarbon resins, aromatic modified aliphatic hydrocarbon resins, hydrogenated polycyclopentadiene resins, polycyclopentadiene resins, gum rosins, gum rosin esters, wood rosins, wood rosin esters, tall oil rosins, tall oil rosin esters, polyterpenes, aromatic modified polyterpenes, terpene phenolics, aromatic modified hydrogenated polycyclopentadiene resins, hydrogenated aliphatic resin, hydrogenated aliphatic aromatic resins, hydrogenated terpenes and modified terpenes, hydrogenated rosin acids, hydrogenated rosin esters, derivatives thereof, and combinations thereof.

58. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more waxes selected from the group consisting of polar waxes, non-polar waxes, Fischer-Tropsch waxes, oxidized Fischer-Tropsch waxes, hydroxystearamide waxes, functionalized waxes, polypropylene waxes, polyethylene waxes, wax modifiers, and combinations thereof.

59. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more additives selected from the group consisting of plasticizers, oils, stabilizers, antioxidants, pigments, dyestuffs, polymeric additives, defoamers, preservatives, thickeners, rheology modifiers, humectants, fillers and water.

60. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more aliphatic naphthenic oils, white oils, combinations thereof, or derivatives thereof.

61. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more polymeric additives selected from the group consisting of homo poly-alpha-olefins, copolymers of alpha-olefins, copolymers and terpolymers of diolefins, elastomers, polyesters, block

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copolymers, ester polymers, acrylate polymers, alkyl acrylate polymers and vinyl acetate polymers.

62. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more plasticizers selected from the group consisting of mineral oils, polybutenes, phthalates, and combinations thereof.

63. (Original) The adhesive of claim 1 wherein the adhesive further comprises one or more plasticizers selected from the group consisting of di-iso-undecyl phthalate, di-iso-nonylphthalate, dioctylphthalates, combinations thereof, or derivatives thereof.

64. (Original) The adhesive of claim 1 wherein the polymer has a peak melting point between 80 and 140°C.

65. (Original) The adhesive of claim 1 wherein the polymer has a Tg of -20°C or less.

66. (Original) The adhesive of claim 1 wherein the polymer has a melt index of 50 dg/min or more.

67. (Original) The adhesive of claim 1 wherein the polymer has a set time of 30 seconds or less.

68. (Original) The adhesive of claim 1 wherein the polymer has a Tc that is at least 10 °C below the Tm.

69. (Original) The adhesive of claim 1 wherein the polymer has an I10/I2 of 6.5 or less.

70. (Original) The adhesive of claim 1 wherein the polymer has a range of crystallization of 10 to 60°C wide.



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71. (Original) A packaging adhesive comprising the adhesive of claim 1.

72. - 108. (Canceled)

109. (Original) A pressure sensitive adhesive comprising the adhesive composition of claim 1.

110. (Original) The pressure sensitive adhesive of claim 109, wherein the adhesive composition has a glass transition temperature (T<sub>g</sub>) of from -65 °C to 30 °C.

111. (Original) The pressure sensitive adhesive of claim 109, wherein the adhesive composition has a storage modulus of from  $1 \times 10^4$  to  $1 \times 10^7$  dynes/cm<sup>2</sup> at 25 °C and 1 radian/second.

112. (Original) The pressure sensitive adhesive of claim 109, wherein the adhesive composition has a Brookfield viscosity of 20,000 mPa·s or less at 150 °C.

113. (Original) The pressure sensitive adhesive of claim 109, wherein the size exclusion chromatography trace of the polymer is bi-modal.

114. (Original) The pressure sensitive adhesive of claim 109, wherein the pressure sensitive adhesive has a brookfield viscosity of 10,000 mPa·s or less at 190°C.

115. (Original) The pressure sensitive adhesive of claim 109, wherein the pressure sensitive adhesive has a set time of 30 minutes or less.

116. (Original) The pressure sensitive adhesive of claim 109, wherein the pressure sensitive adhesive composition is a consumer article.

117. - 170. (Canceled)

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171. (Original) A hot melt adhesive composition comprising the adhesive composition of claim 1.

172. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a percent substrate fiber tear of from 75% to 100% at 25 °C.

173. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a percent substrate fiber tear of from 95% to 100% at 25 °C.

174. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a percent substrate fiber tear of from 50% to 100% at -20 °C.

175. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a percent substrate fiber tear of from 95% to 100% at -20 °C.

176. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a PAFT of 200 °C or less.

177. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a SAFT of 200 °C or less.

178. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a tensile strength at break of 20 bar or more at 25 °C.

179. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has an tensile strength at break of 27 bar or more at 25 °C.

180. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has an tensile strength at break of 34 bar or more at 25 °C.

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181. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has an tensile strength at break of 55 bar or more at 25 °C.

182. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a percent elongation of 200% or more strain of the original length at 25°C.

183. (Original) The hot melt adhesive composition of claim 171, wherein the adhesive composition has a cloud point of 100 °C or less.

184. (Original) The hot melt adhesive composition of claim 171, wherein the hot melt adhesive composition is a consumer good.

185. - 359. (Canceled)

360. (Original) A glue stick comprising an elongated member that includes the adhesive composition of claim 1.

361. (Original) The glue stick of claim 360, wherein the glue stick produces an adhesive deposition on a substrate upon application of pressure or heat.

362. (Original) The glue stick of claim 361, wherein the substrate is selected from the group consisting of paper, paperboard, containerboard, tagboard, corrugated board, chipboard, kraft, cardboard, fiberboard, plastic resin, metal, metal alloys, foil, film, plastic film, laminates, sheeting, wood, plastic, polystyrene, nylon, polycarbonate, polypropylene, styrofoam, porous substrates, polyvinylchloride, walls, and polyester.

363. (Original) The glue stick of claim 360, wherein the adhesive composition further comprises one or more additives selected from the group consisting of plasticizers, oils, stabilizers, antioxidants, synergists, pigments, dyestuffs, polymeric additives, defoamers, preservatives, thickeners, rheology modifiers, humectants, fillers, water, fragrances, fire

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retardants, colorants, antibiotics, antiseptics, antifungal agents, inorganic salts, gelling agents, binders, surfactants, bases, antimicrobial agents, and anti-foaming agents.

364. (Original) The glue stick of claim 360, wherein the adhesive composition further comprises one or more fillers selected from the group consisting of polyethylene, titanium oxide, and calcium carbonate.

365. (Original) The glue stick of claim 360, wherein the adhesive composition comprises from 5 to 30 percent by weight of the one or more inorganic salts.

366. (Original) The glue stick of claim 360, wherein the adhesive composition comprises 5 percent by weight or less of the one or more colorants, dyes, antioxidants, fragrances, or pigments.

367. (Original) The glue stick of claim 360, wherein the adhesive composition comprises 1 percent by weight or less of the one or more antimicrobial agents.

368. (Original) The glue stick of claim 360, wherein the adhesive composition has a percent substrate fiber tear of from 75% to 100% at 25 °C.

369. (Original) The glue stick of claim 360, wherein the adhesive composition has a percent substrate fiber tear of from 95% to 100% at 25 °C.

370. (Original) The glue stick of claim 360, wherein the adhesive composition has a PAFT of 60 °C or more.

371. (Original) The glue stick of claim 360, wherein the adhesive composition has a SAFT of 70 °C or more.

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372. (Original) The glue stick of claim 360, wherein the adhesive composition has a viscosity of from 1 Pa·s to 50 Pa·s at 177 °C.

373. (Original) The glue stick of claim 360, wherein the adhesive composition has a softening point of from 70 to 100 °C.

374. (Original) The glue stick of claim 360, wherein the adhesive composition has an application temperature of 190 °C or less.

375. (Original) The glue stick of claim 360, wherein the adhesive composition has a Dot T-Peel of from 3 N to 4,000 N.

376. - 426. (Canceled)

427. (New) The adhesive of claim 1 wherein the polymer has an amorphous content of at least about 60%.

428. (New) The adhesive of claim 1 wherein the polymer has an amorphous content of at least about 70%.

429. (New) The adhesive of claim 1 wherein the polymer has an amorphous content of between about 50 and about 99%.

430. (New) The adhesive of claim 1 wherein the polymer has a percent crystallinity of between about 5% and about 40%.